REMARKS

These remarks are in response to the Final Office Action dated August 18, 2009. This response is accompanied by a Request for Continued Examination. Applicants respectfully request a three month extension of time. Authorization is given to charge Deposit Account No. 50-0951 for the appropriate extension fees.

At the time of the Office Action, claims 1-4 were pending in the application. Claims 1-4 were objected to for informalities and were rejected under 35 U.S.C. §103(a). The objections and rejections are discussed in more detail below.

I.　　Claim Objections

Claims 1-4 were objected to for the informalities listed in the Office Action. Appropriate corrections are made herein to overcome the objections, and withdrawal of the objection is thus respectfully requested.

II.　　Claim Rejections on Art

Claims 1-4 were rejected under 35 U.S.C. §103(a) as being unpatentable over EP 0094208 to Agarwal (hereafter "*Agarwal*") in combination with EP 1153653 to Filippi et al. ("*Filippi*"). Applicants respectfully submit that claim 1 is patentable over these references.

On page 4, first paragraph, the Office Action asserts that the algorithms disclosed and taught in *Agarwal* would be fully capable of setting the velocity of the heat exchange fluid to the values as defined in present claim 1. Without entering into a discussion whether this is correct, it is simply noted that neither *Agarwal* nor *Filippi* disclose or suggest setting the velocity of the heat exchange fluid in method of the type recited in the preamble of present claim 1. As noted in the Office Action, a person of ordinary skill in the art would have used the algorithm taught in *Agarwal* to allow the transfer of the largest possible amount of heat between the operating fluid and catalytic bed and maximize the heat exchange coefficient inside the exchangers (see Office Action, page 5, lines 3-7). Notably, this approach is discussed in the prior art section of the present application with respect to known methods (see for instance paragraph [0004] of the A1 publication of the present application).

Therefore, as per the admission in the Office Action, a the skilled person combining the teachings of *Agarwal* and *Filippi* would have set the velocity of the heat exchange fluid in a way

that is generally known in the art (in order to transfer the largest possible amount of heat), but such an approach is in clear contrast with the claimed method. Indeed, it was only after the studies carried out by Applicants that it was determined that by setting the velocity of the heat exchange fluid according to the teaching of the prior art a non-homogeneous distribution of the temperature in the catalytic bed is obtained, negatively affecting the reaction conditions and thus the global yield of the reactor itself. By setting the velocity in the way recited in the claimed method it is advantageously and surprisingly possible to improve the homogeneity of the temperature within the catalytic bed and thus also the reaction conditions and global conversion yield.

It should also be noted that the specific setting of the velocity of the heat exchange fluid as recited in present claim 1 not only is not suggested in the prior art but also it cannot be considered as the sole possible way of setting the velocity. The mere fact that a reactor is operated in isothermal conditions does not at all mean that it is operated according to the claimed method. Without knowing in advance the claimed method and without exerting inventive skill, a skilled person would have operated the reactor under isothermal conditions by applying the methods conventional in the art as stated at paragraph [0004] of the Al publication or at page 5, lines 3-7 of the Office Action.

Finally, Applicants maintain what has been said in the previous response concerning the influence of the phase change to the heat transfer coefficient. Page 7 of the Office Action cites the Dittus-Boelter and Sieder-Tate equations. The general formula for these equations reads as follows:

$$Nu = C * Re^x * Pr^y \quad (Eq\ 1.0)$$

These equations are applied in case of heat transfer in tubes without phase change. Therefore, contrary to what is stated in the Office Action, these equations would have not been applied by the skilled person when considering the disclosure of *Agarwal*. In case of evaporation, as is the case in *Agarwal*, the use of other equations that are dependent on the boiling regime applies. These equations are usually highly related to temperature differences, heat flux and steam quality.

For example, a commonly used correlation for nucleate boiling is the Forster-Zuber correlation, where the heat transfer coefficient is dependent on saturation temperature difference, saturation pressure difference, latent heat and physical properties of the liquid phase:

$$h_{nb} = 0.00122 \left[\frac{k_L^{0.79} C_{pL}^{0.45} \rho_L^{0.49}}{\sigma^{0.5} \mu_L^{0.29} \lambda^{0.24} \rho_v^{0.24}} \right] (Tw - Ts)^{0.24} (p_w - p_s)^{0.75}$$

where h_{nb} = nucleate, pool, boiling coefficient, W/m^2°C,

        k_L = liquid thermal conductivity, W/m°C,

        C_{pL} = liquid heat capacity, J/kg°C,

        ρ_L = liquid density, kg/m^3,

        μ_L = liquid viscosity, Ns/m^2,

        λ = latent heat, J/kg,

        ρ_v = vapor density, kg/m^3,

        T_w = wall, surface temperature, °C,

        T_s = saturation temperature of boiling liquid, °C,

        p_w = saturation pressure corresponding to the wall temperature, T_w, N/m^2,

        p_s = saturation pressure, corresponding to T_s, N/m^2,

        σ = surface tension, N/m.

In case of forced convective boiling, which means combined nucleate boiling and forced convection, the Chen correlation is usually applied:

$$h \approx S*h_{NB} + F*h_C$$

where S and F are correction factors, h_{NB} is the Forster-Zuber coefficient for nucleate boiling and h_C is the heat transfer coefficient for forced convection of liquids in the form of (Eq 1.0). At high heat fluxes and low steam quality, forced convective boiling is governed by nucleate boiling.

In a system of the type disclosed in *Agarwal*, it is thus the phase change (the evaporation) that determines the heat transfer coefficient between the coolant (heat exchange fluid) and the reactants. With the evaporation of the coolant the heat transfer coefficient in the heat exchanger is always much higher than the heat transfer coefficient of the reactants and determines the

whole heat transfer coefficient of the system. It is thus not possible to effectively control or change the heat transfer coefficient during operation of the reactor. The heat transfer coefficient of the system remains fixed and corresponds to that of design depending on the type of coolant used.

Therefore, contrary to the method of the present claims, in *Agarwal*, by varying the speed of the heat exchange fluid, the heat transfer coefficient inside the reactor is not changed since such fluid evaporates during its passage through the heat exchanger inside the reactor.
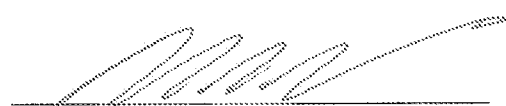
For the foregoing reasons, claims 1 and 4 are patentable over the prior art. Claims 2 and 3 are also patentable because of their dependence on an allowable base claim, and because of the further features recited therein.

III.   Conclusion

Applicants have made every effort to present claims which distinguish over the prior art, and it is thus believed that all claims are in condition for allowance. Nevertheless, Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. In view of the foregoing remarks, Applicants respectfully request reconsideration and prompt allowance of the pending claims.

Respectfully submitted,

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